Presidential Green Chemistry Challenge Awards Program:

Nomination Package for 2012 Awards

Closing Date: December 31, 2011

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Introduction

THE PRESIDENTIAL GREEN CHEMISTRY CHALLENGE was established to recognize and promote innovative chemical technologies that prevent pollution and have broad applicability in industry. The Challenge is sponsored by the Office of Chemical Safety and Pollution Prevention of the U.S. Environmental Protection Agency (EPA) in partnership with the American Chemical Society Green Chemistry Institute and other members of the chemical community.

This nomination package contains explicit instructions on how to enter the competition. Entries must be sent no later than December 31, 2011. Awards will be presented the following summer in Washington, D.C.

Scope of the Program

A. Source Reduction

The Presidential Green Chemistry Challenge recognizes chemical technologies that incorporate the principles of green chemistry into chemical design, manufacture, and use. For the purposes of the program, green chemistry is defined as the use of chemistry for source reduction.

The term "source reduction" includes any practice which:

> (i) reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and
>
> (ii) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

The term "source reduction" does not include any practice which alters the physical, chemical, or biological characteristics or the volume of a hazardous substance, pollutant, or contaminant through a process or activity which itself is not integral to and necessary for the production of a product or providing a service.

Source reduction prevents the formation of any hazardous substance in any chemical product or process. Source reduction is the highest tier of the risk management hierarchy as described in the Pollution Prevention Act of 1990 (PPA).[1] It is preferable to recycling, treatment, or disposal. Chemical technologies that include recycling, treatment, and disposal may be eligible for the Challenge Program if they offer source reduction over traditional technologies for recycling, treatment, and disposal.

B. Green Chemistry

Green chemistry reduces or eliminates the use or generation of hazardous substances from chemical products and processes. Green chemistry improves upon all types of chemical products and processes by reducing impacts on human health and the environment relative to competing technologies.

Green chemistry technologies encompass all types of chemical processes including syntheses, catalyses, reaction conditions, separations, analyses, and monitoring. A green chemistry technology can involve implementing incremental improvements at any stage. It can, for example, substitute a greener feedstock, reagent, catalyst, or solvent in an existing synthetic pathway. A green chemistry technology also can involve substituting an improved product or an entire synthetic pathway. Ideally, a green chemistry technology incorporates the principles of green chemistry at the earliest design stages of a new product or process. Benefits to human health and the environment may occur at any points in the technology's lifecycle: extraction, synthesis, use, and ultimate fate.

C. Eligibility of Organizations for Awards

Companies (including nonprofit organizations) and their representatives are eligible for Presidential Green Chemistry Challenge Awards for operating outstanding or innovative source reduction programs (including research programs).

Public academic institutions, such as state and tribal universities and their representatives, are eligible for Presidential Green Chemistry Challenge Awards for projects or programs that prevent, reduce or eliminate air or water pollution or the adverse health effects of solid waste entering into the waste stream.

D. Additional Requirements

To be eligible for an award, a green chemistry technology must have reached a significant milestone within the past five years (e.g., been researched, demonstrated, implemented, applied, patented, etc.). It must also have a significant U.S. component: the research, development, or aspects of the technology that occurred within the United States. If the only aspect of the technology within the Unites States is product sales, the nomination may not meet the scope of the program.

If you have a question about the eligibility of your technology, please email us at greenchemistry@epa.gov

Focus Areas

Nominated green chemistry technologies should be an example of one or more of the following three focus areas:

1. The use of greener synthetic pathways

This focus area involves designing and implementing a novel, green pathway for a chemical product. Examples include synthetic pathways that:

- Use greener feedstocks that are innocuous or renewable (e.g., biomass, natural oils).

- Use novel reagents or catalysts, including biocatalysts and microorganisms.
- Are natural processes, such as fermentation or biomimetic synthesis.
- Are atom-economical.
- Are convergent syntheses.

2. The use of greener reaction conditions

   This focus area involves improving conditions other than the overall design or redesign of a synthesis. Greener analytical methods often fall within this focus area. Examples include reaction conditions that:
   - Replace hazardous solvents with solvents with a lesser impact on human health and the environment.
   - Use solventless reaction conditions and solid-state reactions.
   - Use novel processing methods that prevent pollution at its source.
   - Eliminate energy- or material-intensive separation and purification steps.
   - Improve energy efficiency, including reactions running closer to ambient conditions.

3. The design of greener chemicals

   This focus area involves designing and implementing chemical products that are less hazardous than the products or technologies they replace. Examples include chemical products that are:
   - Less toxic than current products.
   - Inherently safer with regard to accident potential.
   - Recyclable or biodegradable after use.
   - Safer for the atmosphere (e.g., do not deplete ozone or form smog).

Many green chemistry technologies fit into more than one focus area. Technologies that do not fit within at least one focus area may not fall within the scope of the program.

EPA is particularly interested in technologies that reduce or eliminate high priority chemicals that are of particular concern for children's exposures. Examples would be substitutes for formaldehyde, lead, mercury, diisocyanates, phthalates, bisphenol A (BPA) and certain flame retardants, such as decabromodiphenyl ethers (decaBDE) and hexabromocyclododecane (HBCD), for use in expanded and extruded polystyrene. Alternatives that replace persistent, bioaccumulative, and toxic substances are of particular interest. Innovative alternative approaches, such as development of inherently flame retardant plastics or fabrics, are encouraged.

Award Categories

Typically, EPA presents one award in each of the following categories:

- Small Business: A small business[2] for a green chemistry technology in any of the three focus areas.
- Academic: An academic investigator for a technology in any of the three focus areas.
- Focus Area 1: An industry sponsor for a technology that uses greener synthetic pathways.
- Focus Area 2: An industry sponsor for a technology that uses greener reaction conditions.

- Focus Area 3: An industry sponsor for a technology that includes the design of greener chemicals.

Selection Criteria

Nominated chemistry technologies must fall within the scope of the program. Technologies that meet the scope will then be judged on how well they meet the following criteria:

1. Science and innovation

   The nominated chemistry technology should be innovative and of scientific merit. The technology should be, for example:
   - Original (i.e., never employed before).
   - Scientifically valid. That is, can the nominated technology or strategy stand up to scientific scrutiny through peer review? Does the nomination contain enough chemical detail to reinforce or prove its scientific validity? Has the mechanism of action been clarified via scientific research?

2. Human health and environmental benefits

   The nominated chemistry technology should offer human health and/or environmental benefits at some point in its lifecycle from resource extraction to ultimate disposal. The technology might, for example:
   - Reduce toxicity (acute or chronic) or the potential for illness or injury to humans, animals, or plants.
   - Reduce flammability or explosion potential.
   - Reduce the use or generation of hazardous substances, the transport of hazardous substances, or releases to air, water, or land.
   - Improve the use of natural resources, for example, by substituting a renewable feedstock for a petrochemical feedstock.

   Quantitative statements of benefits are more useful to judges than qualitative ones.

3. Applicability and impact

   The nominated chemistry technology should have a significant impact. The technology may be broadly applicable to many chemical processes or industries; alternatively, it may have a great impact on a narrow range of chemistry. Commercial implementation can support the applicability and impact of a technology. Nominations for pre-commercial technologies should discuss economic feasibility. The nominated technology should offer the following:
   - A practical, cost-effective approach to green chemistry.
   - A remedy for a real environmental or human health problem.
   - One or more technical innovations that can be transferred readily to other processes, facilities, or industry sectors.

How to Enter

Self-nominations are allowed and welcomed. There is no entry fee and no standard entry form, but nominations must meet certain requirements. Nominations must be single-spaced and no longer than eight pages with 12-point type; references, captions, and footnotes may be as small as 10-point. When printed on 8½-by-11-inch paper, they must have margins of at least 1 inch.

Nominations that do not meet these requirements may be rejected by EPA. Nominations may include chemical reactions, tables, graphs, charts, photographs, diagrams, and other illustrations as part of the eight pages. Although nominations may be in color, the judges can read the nominations printed in black and white. Nominations should not, therefore, require color for interpretation.

A nomination must include the following:

1. A cover page with the

   a. **Project title** followed by the **date** of the nomination.

   b. **Primary sponsor(s)**: the individual or organizational owner(s) of the technology. For academic nominations, the primary sponsor is usually the principal investigator. For nominations with more than one sponsor, each co-sponsor should have had a significant role in the research, development, or implementation of the technology.

   c. **Contact person**: the one individual with whom EPA should communicate regarding the nomination. For academic nominations, the contact person is usually the principal investigator. For other nominations, the contact should be a project manager or other technical representative. Include the full mailing address, email address, and telephone number of the contact person.

   d. **Contributors** (optional): those individuals or organizations that have provided financial or technical support for development or implementation of the nominated technology.

EPA will add the person listed as a contact to a contact database. EPA periodically sends reminders and updates about the program to those in this database. Anyone may opt out at any time.

2. The second page should contain the following information:
   - Project title.
   - *Short* description of the most recent milestone for the nominated technology and the year it occurred. For 2012, milestone dates must be 2007 or later. One or two lines are sufficient. Examples include, but are not limited to: critical discovery made, results published, patent application submitted or approved, pilot plant constructed, technology implemented or commercialized, and relevant regulatory review (e.g., by EPA under TSCA[3] or FIFRA[3]; by the U.S. Food and Drug Administration under FFDCA[4]) initiated or completed. Only one milestone with the year it occurred is required.
   - A sentence indicating whether the nominated technology is eligible for the small business award, the academic award, both, or neither.
   - Identification of the EPA award focus area (or areas) that fit your technology. The focus areas are (1) the use of greener synthetic pathways; (2) the use of greener reaction conditions; and (3) the design of greener chemicals. See pages 2 and 3 for descriptions of the three focus areas. No explanation is needed.
   - A one- or two-sentence description of the U.S. component: the research, development, or aspects of the technology that occurred within the United States. If the only aspect of the technology within the Unites States is product sales, the nomination may not meet the scope of the program.
   - An abstract (not to exceed 350 words) that describes the nominated technology, the problem it addresses, and its benefits. Include the state of

implementation of the technology and any quantitative benefits such as amount (or potential amount) of hazardous substances eliminated. EPA plans to publish these abstracts in its annual Summary of Award Entries and Recipients booklet. If you are renominating a technology, you may use the abstract previously published by EPA in whole or in part.

The information in this section should fit on page 2, but you may continue on page 3 if necessary.

3. The remaining pages should explain in detail how the nominated technology meets both the scope of the program (see pages 1-2) and the selection criteria (see page 4). Explain the following:
   - The *chemistry* of the new technology, emphasizing how the technology is innovative and of scientific merit. Consider including chemical structure diagrams rather than text to describe your chemistry. Patent numbers or references to peer-reviewed publications may strengthen your nomination. The judges recognize the interdisciplinary nature of green chemistry; however, to be eligible for an award, your technology must include a significant chemistry component.
   - The problem (environmental or human health risk) that your technology addresses, the importance of that problem, and how your technology solves the problem.
   - How your technology compares with other technologies that may address the same problem.
   - The realized or potential benefits and drawbacks across all stages of your technology's lifecycle: from feedstocks to manufacture to use of the product to ultimate disposal of the product.

IMPORTANT: To make the strongest presentation of your technology for the judges, you should include as much nonproprietary detail as possible in your nomination. The judges will pay close attention to the specifics of your chemistry, including detailed reaction pathways, comparisons to existing technology, toxicity data, quantities of hazardous substances reduced or eliminated, degree of implementation in commerce, and other technical, human health, environmental, and economic benefits. The judges recognize that some sponsors will not be able to conduct a full lifecycle analysis, but like to see a discussion of impacts across the lifecycle. In addition, EPA strongly encourages you to compare the cost, performance, and environmental profile of your technology with any competing technologies. This may help you demonstrate the broad applicability of your technology.

It may help the judges if you address the status of any novel chemical substances or organisms under any appropriate laws such as TSCA[3], FIFRA[3], or FFDCA[4], especially if the technology is or is about to be commercially available.

You may include structure diagrams, tables, other graphics, and references, but all information must fit within the eight-page limit. You may use color in your nomination, but be aware that the nomination may be printed in black

and white, so information in color may be illegible. You may add hot links to published articles, patents, etc. Nominations should not rely on information in links, however, to present their technology and judges may (or may not) follow any links.

You may nominate more than one technology, but you must submit a separate nomination for each technology. You should probably combine multiple applications of the same general technology in a single nomination, however.

All entries received will be considered public information. No material will be returned. Program sponsors are not responsible for lost or damaged entries. EPA acknowledges receipt of nominations by email to the person listed as the Contact Person on page 1. If you have not received an acknowledgment by mid-January, please contact the Green Chemistry Program at greenchemistry@epa.gov or (202) 564-8740.

Submit an electronic copy of the nomination in such a format that EPA can *select and copy text from it.* Please include the primary sponsor's name in the file name. It may be to your advantage to submit your nomination as a .pdf file to minimize possible reading errors, but EPA accepts and is able to read all common file types. You should email the electronic copy to greenchemistry@epa.gov. If you cannot send the file via email, you may send it on a CD or flash drive, clearly labeled with the sponsor(s). The nomination must be sent no later than December 31, 2011.

Note: Irradiation of Federal mail may damage electronic media. To send a disk or flash drive, please use a package delivery service and the following address:

Presidential Green Chemistry Challenge
U.S. Environmental Protection Agency
c/o Dr. Carol Farris
EPA East, Room 5133
1201 Constitution Ave., NW
Washington, DC 20004
Telephone: 202-564-8740

Judging Entries

A panel of technical experts convened by the American Chemical Society Green Chemistry Institute will judge nominations. These experts might include members of the scientific, industrial, governmental, educational, and environmental communities. The judges may request verification of any chemistry described or claims made in nominations that are selected as finalists. The judges will select as award recipients those green chemistry technologies that best meet selection criteria.

Notification of Winners

Winners will be notified prior to the official public announcement, which will be made in summer 2012, in Washington, D.C. A crystal sculpture will be presented to the primary sponsor(s) of the winning green chemistry technology in each of the five award categories. Certificates will be presented to individuals (as identified by the primary sponsor(s)) who contributed to the research, development, or implementation of the chemistry.

Additional Information

Direct any questions about eligibility, nomination procedures, or the Presidential Green Chemistry Challenge program to EPA's Industrial Chemistry Branch at greenchemistry@epa.gov or (202) 564-8740.

Sample Cover Page

Please use the format below for the cover page of your nomination.

Nominations with an Academic Sponsor

Title of Nomination
Date of Nomination

Primary Sponsor(s):
Full Name (Primary Investigator)
Name of Institution

Contact Person:
Full name
Title
Address
Phone
Email

Contributor(s): (optional) Individuals and/or organizations

Nominations with a Business Sponsor

Title of Nomination
Date of Nomination

Primary Sponsor(s):
Company Name
Full Name (optional)
Title (optional)
Address (optional)
Phone (optional)
Email (optional)

Contact Person:
Full name
Title
Address
Phone
Email

Contributor(s): (optional) Individuals and/or organizations

Award Nomination Checklist

Include the following components (see "How to Enter," page 4, for details):

- ☐ Cover page.
- ☐ Short description of the most recent milestone and the year it occurred; only one milestone is required.
- ☐ Statement indicating whether the nomination is eligible for an award in the academic category, the small business category, both, or neither.
- ☐ Statement identifying the EPA award focus area(s) for the nominated technology.
- ☐ Statement of the activities that took place within the United States.
- ☐ Abstract (350 words or fewer).
- ☐ Detailed description of how the nominated technology meets the scope of the program and the selection criteria.

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[1]Pertinent sections of the Pollution Prevention Act of 1990: Sec. 6601.
SHORT TITLE. This subtitle may be cited as the "Pollution Prevention Act of 1990." Sec. 6602. FINDINGS AND POLICY.

(b) Policy. - "The Congress hereby declares it to be the national policy of the United States that pollution should be prevented or reduced at the source whenever feasible."

Sec. 6603. DEFINITIONS. For the purposes of this subtitle -"(5)(A) The term "source reduction" means any practice which:

(i) reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal, and

(ii) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants."

[2]A small business is defined here as one with annual sales of less than $40 million, including all domestic and foreign sales by the company, its subsidiaries, and its parent company.

[3]TSCA is the Toxic Substances Control Act; FIFRA is the Federal Insecticide, Fungicide, and Rodenticide Act.

[4]FFDCA is the Federal Food, Drug, and Cosmetic Act.

United States
Environmental Protection Agency
(7406M)
Washington, DC 20460

Official Business
Penalty for Private Use $300